Application Note BATT1006

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BATT1006 - Impurity Analysis for NCM Cathode Material

Introduction

Trace impurities inside cathode active materials affect battery properties and are a factor that causes degradation. Even trace Na and Mg impurities that are difficult to analyze with energy dispersive X-ray fluorescence (EDXRF) can be analyzed with precision using wavelength dispersive X-ray fluorescence (WDXRF). Additionally, with the standardless FP analysis method, it is possible to analyze from ppm levels of light to heavy elements up to 100% without preparing a calibration curve using standard samples.

Composition analysis

- **Analysis:** Processed materials
- **Analysis method:** Standardless FP analysis method
- **Use:** Quality assurance
- **Analyzed materials:** $Li(Ni_xCo_yMn_z)O_2$

Table 1: Standardless FP analysis results for NCM powder samples A to J (ppm)

	Na	Mg	Al	Si	Ca	Fe
A	201	152	14915	291	ND	66
B	61	ND	40	339	ND	80
C	61	17	31	115	ND	87
D	160	44	50	258	54	145
E	227	79	164	381	44	21
F	655	30	1119	256	11	104
G	152	72	57	361	86	112
H	300	68	43	246	118	118

I	330	75	51	428	43	24
J	256	63	36	454	97	97

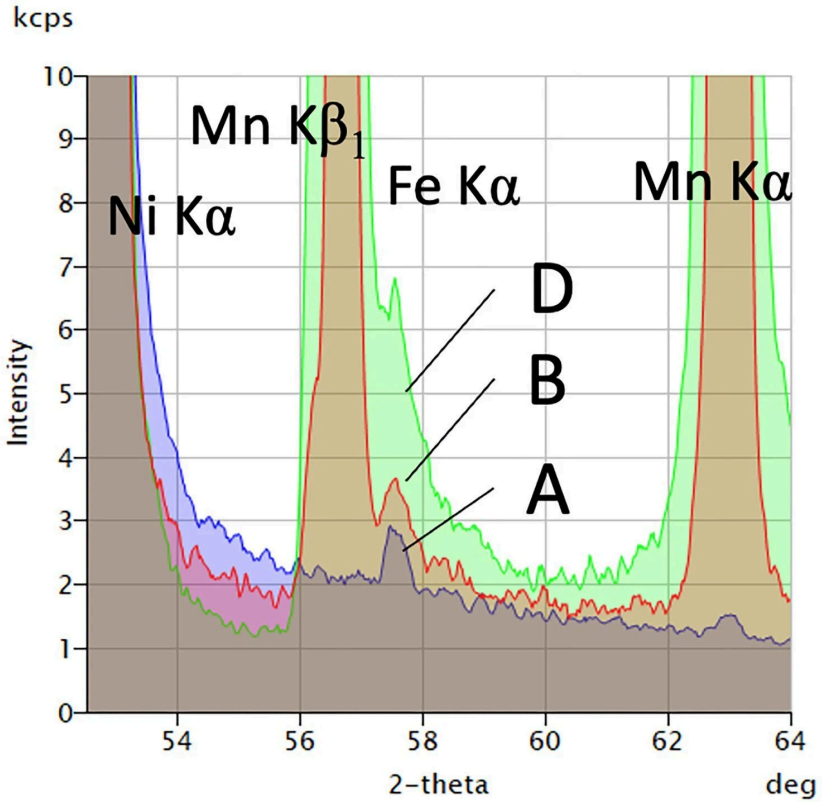

Figure 1: Fe spectrum based on WDXRF

Conclusion

Na, Mg, Al, Si, Ca, Fe and other impurities were detected. Because Fe and Mn can be separated, it is possible to analyze the peak of trace Fe impurities.

Compared to EDXRF, WDXRF has higher energy resolution and is less prone to being affected by interfering lines, making it possible to obtain high sensitivity even with light elements such as Na and Mg. As such, with WDXRF, highly reliable analysis values can be obtained for a wide range of elements.

Related products

ZSX Primus IV

High power, tube above, sequential WDXRF spectrometer wi
th new ZSX Guidance expert system software